



COCONINO COUNTY PUBLIC WORKS DEPARTMENT REINFORCED CONCRETE STANDARDS

All concrete and steel shall be placed and tested in accordance with this section, unless otherwise stated by the County Engineer or his/her representative. Upon completion of the concrete project, the project engineering firm must submit a *report* to the County Engineering Department. The report shall comply with the subheading in this section titled “*reports*”.

The following standards shall be considered the minimum standards to be used on Coconino County concrete projects. Additional recommendations and specifications may also be incorporated for construction if stated in a project engineering report, or as shown on the project plans.

Concrete and Cementitious Materials

The contractor shall be responsible for producing, transporting, and placing concrete and all related materials, in conformance with this section. All work performed, and material used shall be warranted from defect by the contractor for a period of 1 year from the date of final acceptance of the project. Any work necessary to repair damaged or failing areas shall be performed wholly at the contractor’s expense, with the repairs made in a timely manner, as determined by the County Engineer.

General Unless otherwise stated within this section, or directed by the County Engineer, **cementitious materials and reinforcement shall be placed in conformance with the American Concrete Institute (ACI) and the International Building Code (IBC) standards.** Suppliers shall conform to ASTM C94 standards, and shall have their scales calibrated annually by ADOT, or other testing agency accepted by the County Engineering Department. Proof of compliance with the *General* provisions in this section shall be submitted by the supplier or contractor if requested by the County Engineering Department.

Mix Design Concrete shall conform to ASTM C94 standards. Concrete for **curb, gutter, and sidewalk shall be a 3,000 psi mix; concrete for all other structures shall be 4,000 psi**, unless otherwise approved by the County Engineer.

The contractor will hire an engineering laboratory to develop the necessary mix design, or a previously County approved mix design may be accepted. The mix design must be **submitted at least one month prior to usage** to the County Engineering Department for review. After acceptance by the County, subsequent changes to the mix design may only be made with the approval of the County Engineer.

Placement and Delivery Concrete shall comply with ASTM C94; “Standard Specifications for Ready-Mixed Concrete”, unless otherwise stated herein. Cementitious material shall be rejected when not in compliance with any project specifications, or the following:

- Placement of cementitious materials below air **temperature of 32°F** shall require **hot water in mix**, unless otherwise approved by the County Engineer.
 - **Hot water** shall only be added during batching, the temperature must then be allowed to stabilize in the aggregate *prior* to adding in cement.
- **Slump:**

<u>For Specified Slump</u>	<u>Tolerance</u>
2” or less	±1/2”
>2” through 4”	±1”
>4”	±1 1/2”
- Cementitious **material Temperature** at time of placement shall be **50°F to 80°F**
- **Air Entrainment:** ±1.5% from specification
- **Mixing and Delivery:**
 - Discharge of concrete shall be completed within **90 minutes** of batching
 - Maximum of **300 drum revolutions** prior to completion of discharge
 - A **tremie** or other methods, as required by the project Engineering firm or County Engineering Department, shall be used to help minimize segregation during placement as necessary.
 - **Water** may be added at the time of arrival to bring the mix to specified slump; then no subsequent water shall be added.
- **Delivery Tickets** must have the following information at the time of delivery:
 - Plant or manufacture name and location
 - Project name, and location of delivery
 - Material batched: Mix #, including all additives
 - Date and Time batched
 - Time of arrival at site
 - Weight or yd³ of material batched into truck
 - Truck number or license
 - Driver name
 - Amount of water added while on-site (gallons)
 - Signature by the Contractor’s representative acknowledging receipt of the product
 - Ready-mix trucks shall bear proof of acceptance by ADOT or other approved government agencies.

Curing Curing shall begin immediately after machine or hand finishing of the concrete is completed, and shall continue for a **minimum of 7 days**, unless otherwise approved by the County Engineering Department.

Curing of all exposed flatwork, and **all concrete exposed to temperatures below 60°F (during the cure time) shall be covered by blanketing**. In cases where temperatures allow; curing compound may be applied (at a minimum of 1 gallon per 100’), or forms may be left in place (all joints/cracks must be sealed tight).

Reinforcement

All reinforcing steel shall be placed in accordance with the **International Building Code (IBC)**, and shall conform to the following, unless otherwise approved by the County Engineer:

- **Delivery** of all steel (and other specified materials) **shall include a Certificate** of manufacture (including tickets and/or data sheets or shop drawings) stating that specifications and standards are met.
- All steel placed must be inspected and approved prior to pouring concrete. **Steel Inspections** shall be performed in accordance with **IBC section 1704.1**.
- **Steel Inspectors** shall be **ICC certified**.
- **All flatwork** (steel, welded wire mesh, etc.) **shall be supported by dobie blocks** (or other material approved by the County Engineering Dept.). The raising of steel *during* a concrete pour will *not* be accepted.
- Any steel placed, but not inspected, or not conforming to project specifications, shall be removed at the contractors' expense.

Quality Control The contractor shall hire an engineering laboratory to sample, test, and document the batching, delivery, and placement of all cementitious materials (QC). The engineering laboratory shall hold current accreditation by AMRL, as described in this section under the subheading "Sampling and Testing of Concrete and Related Materials".

The contractor shall stop placing, and/or remove any unacceptable material upon notification by the engineering lab that the material is out of specifications, and shall not resume placement until the material is shown to the County to be back within project specs. The engineering lab shall submit all testing, sampling, and field observation documentation to the County Engineering Department, as specified in the subheading of this section titled "*reports*".

The County Engineering Department reserves the right to hire an engineering laboratory of their choice to perform quality assurance (QA); including mix design review, and the sampling or testing of cementitious materials, either at the plant and/or during placement. Materials not meeting project requirements will be rejected. Unacceptable materials shall be removed immediately by the contractor, unless the County Engineer agrees to other arrangements.

Sampling and Testing of Concrete and Related Materials

All sampling procedures for concrete and related materials shall be performed in accordance with current ASTM standard test methods, unless otherwise approved by the County Engineer or noted below. **Laboratory testing, field sampling and testing, and inspection or observations, shall be performed by ACI, NICET, or ICC certified personnel only**, unless otherwise approved by the County Engineering Department. **All Engineering laboratories performing work on Coconino County projects shall hold current accreditation by AMRL as an approved AASHTO-R18 Lab.**

Accepted Test Methods are:

Field

Sampling Freshly Mixed Concrete	C172 / 4.02
Slump	C143 / 4.02
Temperature of Freshly Mixed Concrete	C1064 / 4.02
Air Content (Type B Meter) by Pressure	C231 / 4.02
Air Content by Volumetric	C173 / 4.02
Making and Curing Test Cylinders	C31 / 4.02
Unit Weight	C138 / 4.02

Lab

Standards Specifications for Ready-Mixed Concrete	C94 / 4.02
Compressive Strength of Cast Cylinders	C39 / 4.02
Compressive Strength of Drilled Cylinders	C42 / 4.02
Shotcrete Panel Testing (3 Cores)	C1140 / 4.02
Flexural Strength, Beam (3 Point Loading)	C78 / 4.02
Flexural Strength, Beam (Center Point Loading)	C293 / 4.02
Length of Change of Hardened Concrete	C157 / 4.02
Time of Setting of Concrete Mixtures	C403 / 4.02
Air Entraining Admixtures for Concrete	C260 / 4.02
Specifications for Fly Ash	C618 / 4.02
Specifications for Air Entraining Additions	C226 / 4.01
Soil Cement Design	Ariz 220 / ADOT
Compressive Strength of Soil Cement	Ariz 241a / ADOT

Reports Upon completion of a concrete or related project, an engineering report shall be submitted to the County Engineering Department. This engineering report shall be signed by a registered civil or geotechnical engineer, or a NICET Level IV technician. Included in the report shall be:

- **A description of the project**
- **All laboratory and field test results**
- **A plot plan, showing areas of work.**
- **Indication if the project was completed per project specifications, or whether any unacceptable material or work remains; if so, specify.**

All reports shall be submitted to the County Engineering Department within 30 days after the completion of construction. At the request of the County Engineering Department, daily field reports, lab reports, or other information, may be requested during the construction of a project.

Final Acceptance and Payment

- Payment shall only be made for materials used that conform to the project specifications.
- Delivery tickets shall be used in calculation of payment for materials.
- All concrete must have an appearance of uniform finish and color and shall be aesthetically pleasing in appearance, and acceptable to the County Engineer.
- The **finished tolerances** for extruded and cast-in-place concrete shall be the following:
 - Shall not vary more than **3/8" within any 10' length.**
 - Shall not vary more than **1" for entire length.**

- **Cracked, out of tolerance, or otherwise visually unacceptable concrete shall be removed and replaced** prior to County acceptance of the final product. No patching with mortar, epoxy, or other materials will be accepted unless specifically approved by the County Engineering Department.

Safety During the construction process, all applicable “OSHA Standards for the Construction Industry” shall be followed, including (but not limited to) 29 CFR Part 1926, Subpart P – Excavations. All construction equipment and materials shall be safely fenced off from public access during the entirety of the project.

Knowing and following OSHA Safety Standards is the contractor’s responsibility. The County may stop construction on a project until safety concerns have been corrected.

Dust Control Dust and airborne particulate must be safely limited in all areas that a contractor is performing construction, or where equipment is driven to access the work area. Existing paved roadways, driveways, and other paved/concrete areas must be washed or swept free of dirt and debris daily, or as necessary. The County may stop a project until dust and debris have been properly controlled.

Traffic Control Within all residential areas, and other County roadways, flaggers and construction warning signage shall be used during all construction, unless otherwise approved by the County Engineering Department. Flaggers shall be equipped with radio communication when not in full view of each other. Pilot vehicles used during paving and other roadway projects shall be clearly marked, be equipped with warning lights, and be in radio communication with flaggers at each end of the traffic control area.

Traffic control shall be maintained in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), which is published by ATSSA/ITE/AASHTO, and approved by USDOT and the Federal Highway Administration (current edition).

A temporary traffic control plan shall be submitted to the County a minimum of 30 days prior to the commencement of any roadwork (or construction, where the contractor may be crossing the roadway with equipment during construction). The temporary traffic control plan shall conform to Part 6 – Temporary Traffic Control, in the MUTCD.

It is the contractor’s responsibility to comply with the temporary traffic control plan. The County may stop construction on a project until traffic safety concerns have been corrected.

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